

REMARKS

This response accompanies a Request for Continued Examination.

Upon entry of the following amendments, claims 1-7 and 10 will be pending. Claims 12-36, previously withdrawn, are herein canceled. Applicants reserve the right to re-introduce the subject matter of these claims in one or more divisional or continuation applications at a later date.

Claim 1 is amended to provide that the vortex reactor additionally contains a plasma generating device, configured so that the flow restrictor and the vertical rod optionally attached thereto can act as a first electrode and a wall of the frustum-shaped reaction chamber can act as a second electrode of the plasma generating device. Support for these amendments can be found in para. [0045], [0049], and [0050] of the published specification (pages 9-11 of the original specification). Claim 1 is further amended to incorporate an apparatus for applying a voltage difference between the first and second electrodes. Support for this amendment can be found in para. [0048] of the published specification (page 10 of the original specification) and original claim 9.

Claim 2 is amended to provide only that the axial flow apparatus comprises a gas supply, the removed limitation as to the nature of the apparatus having been incorporated into claim 1.

Claim 3 is amended to re-direct its dependency, related to the flow restrictor, to claim 1, consistent with the movement of that subject matter to claim 1.

Claims 8 and 9 are canceled, their subject matter having been incorporated into claim 1. The dependence of claim 10 is amended to reflect the incorporation of the subject matter of claim 9 into claim 1.

No new matter is added by these amendments.

Applicants note that that no mention is made of maintaining (or withdrawing) the previous rejections based on U.S. Patent No. 3,042,830 ("the Orbach reference"); U.S. Patent No. 4,927,298 ("the Tuszko reference"); and U.S. Patent No. 5,116,488 ("the Torregrossa reference"). In the absence of an affirmative statement by the Examiner that these rejections are maintained, and in view of the interview made to the Examiner on March 23, 2011 (the results of

which were recorded in Applicants' last response), Applicants take as read that that they have been withdrawn.

Alleged Deficiency of Oath

The oath dated 28 February 2007 is allegedly defective because non-initialed and/or non-dated alterations were made, with respect to address of inventor, Young Cho. The Examiner has indicated that a new oath in compliance with 37 CFR 1.67(a) is required. A new oath is being filed coincident with this response. Accordingly, Applicants request reconsideration and withdrawal of this rejection.

Alleged Anticipation Over Applicants' Admission

Claim 1 stands rejected under 35 U.S.C. §102(b) as allegedly anticipated by Applicants' admission (page 3, lines 8-24 of the as-filed specification). Applicants traverse this rejection in view of the amendments made to claim 1 and request that the rejection be withdrawn. As amended, the vortex reactor of claim 1 comprises a plasma generating device, configured so that the flow restrictor and/or the vertical rod optionally attached thereto can act as a first electrode and a wall of the frustum-shaped reaction chamber can act as a second electrode of the plasma generating device. This element is not described in the portion of the as-filed specification cited by the Examiner.

Alleged Anticipation or Obviousness Over the Nilsson Patent

Claims 1-7 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over U.S. Patent No. 5,486,269 ("the Nilsson patent"). Applicants traverse this rejection because the Nilsson patent does not contain all of the features of the pending claims, so the Examiner has failed to meet the Office's burden for establishing a prima facie case.

As amended, the vortex reactor of claim 1 contains a plasma generating device, configured so that the flow restrictor and the vertical rod optionally attached thereto can act as a first electrode and a wall of the frustum-shaped reaction chamber can act as a second electrode of the plasma generating device. As described by the Examiner, the Nilsson patent discloses a

reactor comprising a frustum-shaped portion, an axial flow apparatus, a circumferential flow apparatus, and an inlet, and wherein the apparatus can be operated by turning the device 180°. While Applicants disagree that the device can be operated as stated by the Examiner, it is not necessary to make this argument because the Nilsson does not describe a plasma generating device, nor is there any suggestion or teaching which describes such a feature. Instead, the device in the Nilsson patent is directed to a thermal reactor for decomposing carbonaceous raw materials, operating within a temperature range of 500-1000°C. Since the Nilsson patent fails to describe or suggest all of the elements of claim 1, it cannot anticipate or render that claim obvious. Since claims 2-7 all depend from claim 1, they do can neither be anticipated or rendered obvious by the Nilsson patent.

Accordingly, Applicants request reconsideration and withdrawal of these rejections.

Alleged Anticipation or Obviousness Over the Latham Patent

Claims 1-10 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over U.S. Patent No. 3,344,051 (“the Latham patent”). Applicants traverse this rejection because the Latham patent does not contain all of the features of the pending claims, so the Examiner has failed to meet the Office’s burden for establishing a *prima facie* case.

As amended, the vortex reactor of claim 1 contains a plasma generating device, configured so that the flow restrictor and the vertical rod optionally attached thereto can act as a first electrode and a wall of the frustum-shaped reaction chamber can act as a second electrode of the plasma generating device.

As described by the Examiner, the Latham patent discloses a reactor *for cracking gaseous or liquid hydrocarbons* comprising a frustum-shaped portion, an axial flow apparatus (corresponding to the pipe channel (feature 62)), and a circumferential flow apparatus. (office action dated June 3, 2011, page 4). The Examiner further states that the Latham patent teaches the use of an electric arc to generate a plasma arc, citing FIG. 3 and col. 1, lines 14-24 for that teaching for this purpose (*id.*).

First, Applicants disagree with the alleged correspondence of the pipe channel 62 to the axial flow apparatus of the present claim. However, even if such a correspondence were to exist, the reactor of the Latham patent is fundamentally different than that currently claimed. In the Latham patent, even assuming feature 62 is equivalent to the axial flow apparatus of the present claims, it does not form one of the electrodes of the plasma generating device. Instead, features 36(a-f) provide this function, and the gas or liquid feedstock is subjected to this plasma in only a single pass:

The present invention provides a high intensity electric arc which is caused to emanate in rapid sequence from points spaced circumferentially about the periphery of a constricted neck or throat through which is passed at a relatively low velocity, a vortex comprising a carbon black feedstock and a suitable carrier gas. . . . The effect of this distribution of the arc paths is to fill the throat completely with the plasma flame so that all of the feedstock passing therethrough is uniformly and substantially completely cracked to carbon black.

(Latham patent, col. 2, lines 22-43)

This is different than both the configuration and the use of the device of the claimed reactors, which provide for the generation of plasma into the frustum shaped reactor to react with solid reactants.

The Examiner further acknowledges that the Latham patent does not describe an inlet for solid particulate, but states that the intended use of the inlet cannot be given patentable weight in a claimed device. Applicants submit that the intended use of the inlet can be given patentable weight, if such use indicates particular features or character associated with that purpose. The entire purpose of the reactor described in the Latham patent is for *cracking gaseous or liquid hydrocarbons* (Latham patent, col. 3, lines 48-70), whereas the purpose of the device of the present claims is to react solid particles with plasma.

Since the Latham patent fails to describe or suggest all of the elements of claim 1, it cannot anticipate or render that claim obvious. Since claims 2-7 and 9-10 all depend from claim 1, they can neither be anticipated or rendered obvious by the Nilsson patent. Accordingly, Applicants request reconsideration and withdrawal of these rejections.

Alleged Anticipation or Obviousness Over the Foret Patent

Claims 1-3, 6, and 7 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as allegedly obvious over U.S. Patent No. 7,622,693 (“the Foret patent”). Applicants traverse this rejection because the Foret patent does not contain all of the features of the pending claims, so the Examiner has failed to meet the Office’s burden for establishing a *prima facie* case.

As amended, the vortex reactor of claim 1 contains a plasma generating device, configured so that the flow restrictor and the vertical rod optionally attached thereto can act as a first electrode and a wall of the frustum-shaped reaction chamber can act as a second electrode of the plasma generating device.

As described by the Examiner, the Foret patent discloses a vortex reactor comprising a frustum-shaped portion and a circumferential flow apparatus in FIG. 6, and an axial flow apparatus, in FIG. 5 (office action dated June 3, 2011, page 4). Applicants submit that the reactor of amended claim 1 is patentably distinguishable from one which would result from a modification of the reactor described in FIG. 5 (or 6) of the Foret patent, if only by the configuration of the electrode array for generating the plasma. In the Foret reactor, a plasma is formed using two separate plasma devices, described as a “plasma torch in combination with another plasma generation device,” (Foret patent, col. 17, lines 11-15) wherein the microwave plasma torch “acts similar to a pilot light” (*id.* at col. 17, lines 58-59); i.e., the gas is ionized when passing through the plasma torch, and the other plasma generation device comprises RF induction coils (see, e.g., *id.*, col. 18, lines 41-42). By contrast, the device described in the present claims can provide a gliding discharge arc plasma, in which the plasma can be generated by the gliding arc passing between the flow restrictor and/or the vertical rod optionally attached thereto and a wall of the frustum-shaped reaction chamber. This claimed configuration is not taught or suggested by the Foret patent. Accordingly, Applicants request reconsideration and withdrawal of these rejections.

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PATENT

Conclusion

Applicants believe that the foregoing constitutes a complete and full response to the Office Action of record. Applicants respectfully submit that all pending claims are in condition for allowance and entry of the present amendments and notification to that effect is earnestly requested.

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